



W71-04545
WATER POLLUTION CONTROL RESEARCH SERIES • 14010 FLW 07/70

PB 197 594

W71-04545
U. S. DEPT. OF INTERIOR
RECEIVED

DEC 23 1970

OFFICE OF WATER
RESOURCES RESEARCH

Feasibility Study Manual- Mine Water Pollution Control Demonstrations



Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
Springfield, Va. 22151

U.S. DEPARTMENT OF THE INTERIOR • FEDERAL WATER QUALITY ADMINISTRATION

**"AREA ACID AND OTHER MINE WATER POLLUTION CONTROL
DEMONSTRATIONS**

"SEC. 14. (a) The Secretary in cooperation with other Federal departments, agencies, and instrumentalities is authorized to enter into agreements with any State or interstate agency to carry out one or more projects to demonstrate methods for the elimination or control, within all or part of a watershed, of acid or other mine water pollution resulting from active or abandoned mines. Such projects shall demonstrate the engineering and economic feasibility and practicality of various abatement techniques which will contribute substantially to effective and practical methods of acid or other mine water pollution elimination or control.

"(b) The Secretary, in selecting watersheds for the purposes of this section, shall (1) require such feasibility studies as he deems appropriate, (2) give preference to areas which have the greatest present or potential value for public use for recreation, fish and wildlife, water supply, and other public uses, and (3) be satisfied that the project area will not be affected adversely by the influx of acid or other mine water pollution from nearby sources.

"(c) Federal participation in such projects shall be subject to the conditions—

"(1) that the State or interstate agency shall pay not less than 25 per centum of the actual project costs which payment may be in any form, including, but not limited to, land or interests therein that is needed for the project, or personal property or services, the value of which shall be determined by the Secretary; and

"(2) that the State or interstate agency shall provide legal and practical protection to the project area to insure against any activities which will cause future acid or other mine water pollution.

"(d) There is authorized to be appropriated \$15,000,000 to carry out the provisions of this section, which sum shall be available until expended. No more than 25 per centum of the total funds available under this section in any one year shall be granted to any one State.

1	Accession Number	2	Subject Field & Group	SELECTED WATER RESOURCES ABSTRACTS INPUT TRANSACTION FORM	
	W 71-04545		Ø5G, Ø5D		
5	Organization ~~Federal Water Quality Admin., Washington, D.C.~~ NUS Corp, Pittsburgh, Pa. Cyrus Wm. Rice Div.				
6	Title FEASIBILITY STUDY MANUAL - MINE WATER POLLUTION CONTROL DEMONSTRATIONS,				
10	Author(s)		16	Project Designation ~~Contract No 14 12 048 NUS Corp, Cyrus Wm. Rice Div.~~ FWQA Program 14010 FLW	
			21	Note For sale by Superintendent of Documents U.S. Government Printing Office, Wash., D.C. 20402, price 65 cents; microfiche from NTIS as PB 197 594, \$0.95.	
22	Citation ~~Federal Water Quality Administration~~ Water Pollution Control Research Series 14010 FLW 07/70, June 1970. 65 p, 2 fig, 3 ref, 4 append.				
23	Descriptors (Starred First) *Acid mine water, *Water pollution control, *Feasibility, *Project feasibility, *Feasibility studies, Project planning, Federal project. policy, Optimum development plans, Programs, Project purposes, Water pollution treatment, Abatement,				
25	Identifiers (Starred First) *Mine drainage abatement,				
27	Abstract This manual is to be used as a guide by State or interstate agencies in uniformly performing feasibility studies for projects proposed to demonstrate methods for the abatement of mine drainage pollution as required by Section 14 of the Federal Water Pollution Control Act as amended. The required feasibility studies are to aid the Secretary of the Interior in selecting the mine drainage pollution control method or methods suitable for demonstration, and also the optimum watershed where the effectiveness of the project will have the greatest public value or uses. (Knapp-USGS)				
Abstractor George Knapp 6 Jan 71			Institution U.S. Geological Survey, Water Resources Div.		

***Feasibility Study Manual -
Mine Water Pollution Control Demonstrations***

FEDERAL WATER QUALITY ADMINISTRATION
DEPARTMENT OF THE INTERIOR

Program 14010 FLW
June, 1970

This manual was prepared for release by the Federal Water Quality Administration. Portions of this document are based upon material supplied by the Cyrus Wm. Rice Division, NUS CORPORATION, under Contract No. 14-12-848.

ABSTRACT

This manual is to be used as a guide by State or interstate agencies in uniformly performing feasibility studies for projects proposed to demonstrate methods for the abatement of mine drainage pollution as required by Section 14 of the Federal Water Pollution Control Act as amended.

The required feasibility studies are to aid the Secretary of the Interior in selecting the mine drainage pollution control method or methods suitable for demonstration, and also the optimum watershed where the effectiveness of the project will have the greatest public value or uses.

CONTENTS

<u>Section</u>	<u>Page</u>
1 INTRODUCTION AND SUMMARY.....	1
2 MANUAL UTILIZATION.....	5
3 FEASIBILITY STUDY PREPARATION.....	11
4 FORMAT AND CONTENTS OF FEASIBILITY STUDY.....	23
APPENDICES	
A Prefeasibility Planning.....	25
B Format of Application for Section 14 Demonstration Grant.....	27
C Mine Drainage Abatement Technology.....	47
D Typical Data Sources.....	51
INDEX.....	59

TABLES

2.1 DEVELOPMENT OF A MINE DRAINAGE ABATEMENT DEMONSTRATION PROJECT PROPOSAL.....	6
2.2 FEASIBILITY STUDY PREPARATION.....	8

SECTION 1

INTRODUCTION AND SUMMARY

This manual describes the necessary procedures and information required for submission of an application for a grant under Section 14 of the Federal Water Pollution Control Act as amended. It is recognized that all of the information needed for a complete evaluation by the Federal Government may not be available at the time of submission. It is incumbent upon the applicant to appreciate the value of the missing information, and to comment upon the significance as related to the probable success of the project. The applicant should point out alternative approaches which minimize the detrimental aspects of not receiving such data for evaluation by the Government.

It is strongly urged that the applicant contact the Federal Water Quality Administration prior to initiating extensive work upon any proposed project.

Mine drainage is discharged into various local water courses and is carried by the natural flow of the streams into the major rivers. Extensive intrastate and interstate pollution problems are thus created. The pollutorial aspect of mine drainage is a product of chemical reactions between air, water and the minerals found in and around ore deposits. The more common pollutants found in mine drainage may include acids, alkali, heavy or toxic metals, hardness, chlorides, dissolved solids and suspended solids. Upon dilution in the water course, the heavy metals frequently oxidize producing a precipitate or sludge which settles out as silt deposits and destroys bottom life in receiving streams. Highly acidic or basic wastes may strip all forms of life from a stream while some other wastes, such as phosphate wastes, may act to stimulate undesirable algal and vegetative growths in water courses. Mine drainage thus presents a serious pollution problem because of the great quantities involved.

The most extensive mine drainage pollution problem is acid drainage from coal mines and this problem is compounded by the fact that a large fraction of the acid mine drainage comes from abandoned and inoperative mines. Well over 90% of the land involved in abandoned mines is in private hands which poses severe limits on the abilities of governmental units to deal with the problem.

There are a variety of methods and techniques for mine drainage pollution control. New methodology for such control, particularly at source control, must be developed, and existing treatment and control methods must be refined and demonstrated. Specifically, the practicability and economic feasibility of these methods when applied to field scale applications must be more closely defined. In addition, watershed area demonstration projects may provide the opportunity to show ways of putting combinations of these methods together into coordinated attacks on the mine drainage sources from entire watersheds.

A report of the Committee on Public Works of the U. S. Senate accompanying S.7, a bill to amend the Federal Water Pollution Control Act as amended, repeated many times the desirability of the proposed legislation for its assistance in development of projects for the demonstration of feasible and practical area-wide methods of controlling acid pollution resulting from mining activities. The report also stressed the fact that these projects should demonstrate for an entire watershed area the kinds of abatement techniques, and land and water management necessary to eliminate pollution from mine drainage.

The Committee on Public Works of the House of Representatives in its report accompanying HR.4148 also laid stress on the desirability of projects that would demonstrate the engineering and economic feasibility and practicality of using single or multiple abatement methods in an area-wide program within all or part of a watershed. The report also stressed that the purpose of the cost sharing provision was to encourage the states to participate to the greatest extent possible so that there might be developed meaningful projects which would produce the experience needed to develop an effective control program.

The Water Quality Improvement Act of 1970, PL 91-224, included a sub-section titled "Area Acid and Other Mine Water Pollution Control Demonstrations," which became Section 14 of the Federal Water Pollution Control Act as amended. This section provides for the demonstration of techniques for mine drainage pollution control and directs that the Secretary shall require such feasibility studies as he deems appropriate in selecting watersheds for the purpose of the demonstration projects. Such feasibility studies are to aid the Secretary in selecting not only the mine drainage pollution control method or methods but also the watershed or drainage area for such application. The Act requires that the Secretary give preference to areas which will have the greatest public value and uses.

The feasibility studies thus must include an inventory of mine drainage sources within the watershed, downstream water uses, the benefits of pollution control, engineering and economic feasibility of locating the project in the selected area, the feasibility of protecting the project in that area, and the feasibility of protecting the area from future damage once remedial measures have been employed. The Senate Committee report was very concerned about this latter point, pointing out that the project clearly would not be effective if it could be demonstrated that mine drainage pollution in the project area could be controlled, but similar pollution originating outside of the project area continued to pollute the waters in the project watershed area.

The feasibility study must also identify in the proposed drainage area the present and potential public uses such as water supply, fish and wildlife enhancement, and recreational values.

The principal purpose of this manual for feasibility studies is to provide guidelines to be used by States, interstate agencies, or their consultant engineering firms in performing feasibility studies of projects proposed to demonstrate methods for the abatement or control of mine drainage pollution resulting from active or abandoned mines. A further purpose is that a feasibility study carried out in accordance with the directions in this manual will provide all information needed for selection of projects in conformance with the requirements of Section 14 of the Federal Water Pollution Control Act as amended, and consistent with the Legislative intent conveyed through the respective committee reports. Following the guidelines of the manual, all feasibility studies will be prepared in a similar format that will allow comparison with other feasibility studies prepared for other techniques in other watersheds.

The manual also contains in its Appendices a description of the prefeasibility planning process. This section is included to minimize the chances that the feasibility study is performed on methods and watershed areas of little interest or importance to the overall program. The Act is specific in requiring that the demonstration projects contribute substantially to effective and practical methods of acid or other mine water pollution elimination or control.

BLANK PAGE

SECTION 2

MANUAL UTILIZATION

The following section of the manual outlines the process of demonstration project development from inception to grant application. Feasibility study preparation is one aspect of the project development process and it is considered in substantial detail further in this Section and in Section 3. A brief discussion of the total project development process is included to provide a context for the preparation of the feasibility study.

The basic steps in the project development and execution processes include:

- a. Selection of a highly promising abatement method for demonstration
- b. Selection of a suitable site for project implementation
- c. Determination of project feasibility
- d. Execution of required administrative actions including grant applications
- e. Project construction
- f. Demonstration or operation
- g. Final report preparation

The project development process, steps a. through d., is illustrated graphically by Figure 2.1 and is discussed in more detail in Section 3, "Feasibility Study Preparation," and Appendix A, "Prefeasibility Planning."

Prefeasibility planning is an iterative evaluation and comparison of alternatives leading to project selection. As indicated on Figure 2.1, prefeasibility planning includes the process of selecting an abatement method to be demonstrated, selecting a site for implementation of the demonstration project, and making a preliminary estimate of project feasibility.

The inventory of existing conditions indicated on Figure 2.1 as an aspect of prefeasibility planning refers to a

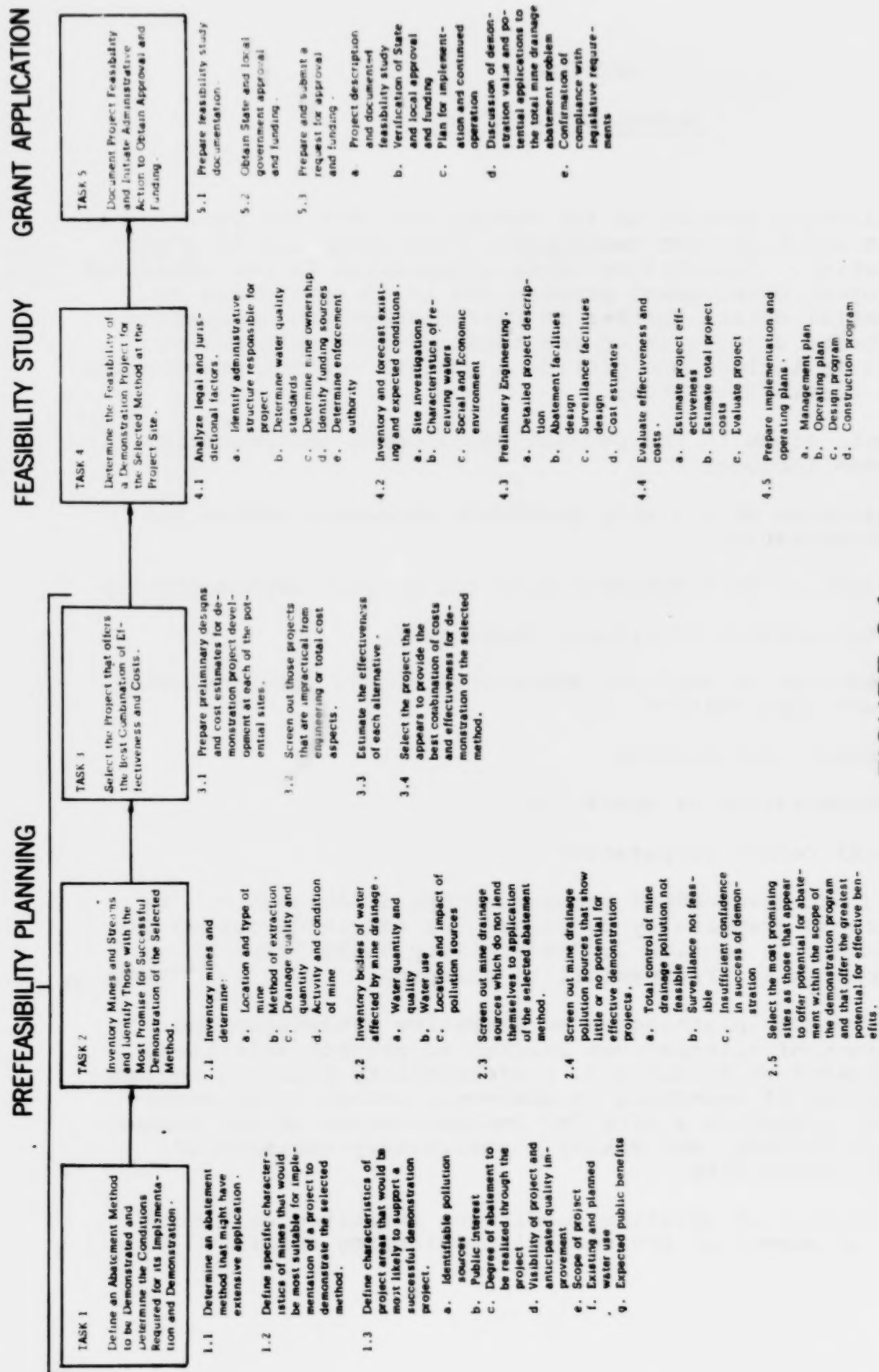


FIGURE 2.1

DEVELOPMENT OF A MINE DRAINAGE ABATEMENT DEMONSTRATION PROJECT

preliminary identification and screening whereby the least promising project sites are eliminated from consideration. Alternative abatement methods should be reviewed in the light of this preliminary inventory of mines and mine drainage pollution problems in the State or region as well as in the context of the overall national Mine Drainage Abatement Demonstration Program.

Pollution sources should be carefully reviewed to identify those which have the most potential for implementation as a project to demonstrate the selected methods. To conform with the requirements of the legislation establishing this demonstration program, the demonstration project must be selected such that it is protected from mine drainage pollution originating above the project in the watershed and such that public benefits will be generated to the extent possible.

The selected project site and abatement method should have the potential to effectively demonstrate a mine drainage abatement method which has promise for extensive application in a mine drainage abatement program. Major steps in the prefeasibility planning process are outlined in Appendix A. The criteria for selection of the abatement method to be demonstrated and the site for project implementation should be documented as part of the feasibility study as covered in Section 3.

Upon completion of the prefeasibility planning and the selection of an abatement method and a project site, a feasibility study must be prepared. This feasibility study will identify the problems which will be encountered during the implementation and operation of the project and will document the proposed solutions to these problems. The basic steps required for the preparation of a feasibility study are outlined on Figure 2.2 and are discussed in more detail in Section 3, "Feasibility Study Preparation." A suggested format for the documentation and presentation of the feasibility study and supporting information is presented in Section 4, "Format and Contents of Feasibility Study."

As a first step in the preparation of the feasibility study, the existing legal and jurisdictional system affecting the proposed project must be analyzed. A legal and administration framework for the implementation and operation of the proposed project must be identified and documented. This documentation should include such pertinent data as enabling legislation, sources of funds,



- A. Analysis of Legal and Jurisdictional Factors**
- A.1 Determine the agencies which will be responsible for project implementation and operation.
 - A.2 Ascertain legal basis for administrative authority.
 - A.3 Determine existing and proposed water quality standards and their legal basis. Determine adequacy of surveillance and enforcement procedures which will affect the project.
 - A.4 Determine mine ownership and site and mineral rights acquisition requirements and evaluate adequacy of legal authority for condemnation and acquisition.
 - A.5 Identify sources of funds, legal basis for funding and long term financial arrangements for continued operation.
 - A.6 Establish that adequate legal authority exists to prevent future pollution from sources outside the project site.
 - A.7 Determine additional legislation or revised regulations which will be required for the implementation and operation of the project.
- B. Inventory and Forecast of Existing and Expected Conditions**
- B.1 Site investigations including:
 - a. Characteristics of mine
 - b. Locations of shafts, boreholes and tunnels
 - c. Mine drainage effluent quality
 - d. Sources of mine water inflow
 - e. Mine drainage outfalls
 - f. Subsurface conditions
 - g. Topography
 - h. Mine drainage quantity
 - B.2 Characteristics of receiving waters.
 - a. Streamflow estimates
 - b. Floods and lowflow characteristics
 - c. Rainfall and runoff relationships
 - d. Stream quality
 - e. Other mine drainage pollution sources
 - f. Other non-mine drainage pollution sources
 - B.3 Social and Economic Environment.
 - a. Population concentrations
 - b. Water uses including water supply, recreation, irrigation, etc.
 - c. Quality requirements of users
 - d. Potential impact of project on expected water use
- C. Preliminary Engineering**
- C.1 Detailed project description.
 - a. Location plan
 - b. Site plans
 - c. Process chemistry
 - d. Expected impact of project on mine drainage quality and/or quantity
 - e. Treatment plant flow diagrams
 - f. Preliminary operating data
 - C.2 Facilities design.
 - a. Prepare preliminary designs for foundations, structures and supporting equipment
 - b. Identify construction materials
 - C.3 Locate and describe surveillance facilities and equipment.
 - C.4 Prepare cost estimates for project construction.
- D. Evaluation of Effectiveness and Project Costs**
- D.1 Estimate measures of project effectiveness.
 - a. Applicability of technique
 - b. Proportion of pollution to be abated at the site
 - c. Unit cost of abatement
 - d. Extent of streams to be improved
 - e. Assurance of success
 - f. Compliance with standards
 - g. Increased recreation potential of stream
 - h. Improved water supply
 - D.2 Estimate total project costs.
 - a. Land and mineral rights acquisition
 - b. Construction costs
 - c. Operating costs
 - d. Maintenance costs
 - e. Engineering costs
 - f. Administrative costs
 - D.3 Evaluate project effectiveness in the light of project costs and expected implementation difficulties to determine feasibility and desirability.
- E. Preparation of Implementation and Operating Plans**
- E.1 Develop management plan and identify agencies responsible for:
 - a. Overall project coordination
 - b. Design
 - c. Construction
 - d. Operation
 - e. Surveillance
 - E.2 Develop detailed operating plan and estimate personnel requirements.
 - a. Determine available manpower
 - b. Plan training programs
 - E.3 Prepare a design program.
 - a. Schedule
 - b. Design costs and funding
 - c. Personnel
 - d. Design Criteria
 - E.4 Prepare a construction program.
 - a. Schedule
 - b. Costs
 - c. Procurement methods
 - d. Supervision of construction

FIGURE 2.2
FEASIBILITY STUDY PREPARATION

proposed allocation of administrative responsibility, ownership and surveillance. Additional legislation or administrative actions which might be required for project implementation should be initiated immediately so as to be completed prior to application for demonstration grant funds.

An inventory of the existing and expected physical and socio-economic environment of the proposed project site must then be made in accordance with the guidelines of Section 3. This inventory will provide supporting data for the design of the project and for the estimation of effectiveness, benefits and cost. Data collected during the inventory phase must be included in the supporting documentation of the feasibility study.

Based on the data collected in the inventory of physical conditions, preliminary designs must be prepared to determine the physical practicability of the project as well as the cost of development. Preliminary engineering should be based on sound field survey data including laboratory analyses of water quality, subsurface investigations, hydrologic and topographic data. The expected impact of the project must be translated into measures of effectiveness as described in Section 3, and project costs documented. As a final step in the preparation of the feasibility study, plans for implementation and continued operation should be prepared.

The desirability and feasibility of a mine drainage abatement demonstration project will be determined by a combination of factors including:

- a. Technical feasibility
- b. Demonstration value
- c. Economics and public benefits
- d. Political and jurisdictional factors

The dual criteria of desirability and feasibility are included since a project or an aspect of a project might be feasible, in the strict sense of the word, while the difficulties and costs of the solution might outweigh the value of the project. For example, if extensive legislative changes are required to enable project implementation, these changes might be possible but not without extensive delays and political and economic costs which would be considered excessive when evaluated in the light of expected project effectiveness. The rationale for determining that the

project is feasible and desirable should be included in the summary of Section 3.

In addition to the preparation of the feasibility study and supporting documentation, several administrative tasks must be executed prior to obtaining a demonstration grant for the proposed project. These tasks are outlined on Figure 2.1 and in Appendix B in terms of the resulting documentation which must accompany a request for funding under the demonstration grants program.

SECTION 3

FEASIBILITY STUDY PREPARATION

The feasibility study has as its purpose the determination and collection of appropriate, meaningful data about a proposed demonstration project (techniques and project site) and the careful exposition of the benefits to be gained from the proposed project. It is not a study of alternatives but must confine itself to one project site and one proposed solution. The site will be a watershed area with all of that surface and subsurface drainage above the project site being included. While only one project is to be considered by one feasibility study, such project may include one or more individual control methods at one or more locations within the project's watershed area.

In performing the feasibility study, each of the major steps in this Section 3 must be addressed in adequate detail such that the merits and demerits are clearly evident for the proposed project. The study need not be limited to only those steps shown however.

A. JURISDICTIONAL FRAMEWORK

It is essential that the legal authority is clearly established for the State or interstate agency to engage in all facets of the demonstration project. The agencies concerned with acquisition, design, construction, and operation must be identified as well as the orders and regulations under which they operate relevant to the proposed mine drainage demonstration project. How the project would operate under existing legal authority is extremely important.

1. Cognizant Authority

State the legislation, regulations, or other orders under which the State or interstate agency has authority to work in mine drainage abatement. List the subagencies responsible for contracting, administering, and operating the proposed demonstration project and the scope of their operations as well as their relevance to mine drainage. Discuss clearly the adequacy of the present legal and administrative structure to accomplish the purposes of the project.

2. Existing and Proposed Standards

List any present or proposed water quality standards for the stream or streams involved. Show how any stated quality requirements for treated effluents are or are not relevant to the project. Discuss any proposed higher public uses of the waters concerned and the criteria associated with such uses. Discuss how the project proposes to effect quality of the drainage so as to meet the subject criteria. Discuss the applicability of existing water quality and land use standards for the proposed uses. Discuss what agencies are charged with surveillance and enforcement of standards and whether the capability and authority exists to accomplish the surveillance and enforcement required by the project.

3. Site Acquisition

Determine the legal authority by which purchase of lands, easements, condemnation, leases, or other access control techniques of the proposed site may be obtained. Discuss how and when site acquisition will be accomplished within present legal authority as well as the duration of such acquisition.

4. Authority for Funding

Determine the legal basis for the funding of the proposed mine drainage demonstration project. Discuss how such funding will be accomplished within the present framework, the agencies involved, and their authority. The post-demonstration aspects of funding as well as the immediate aspects must be set forth.

5. Water and Mineral Rights

Determine what water and mineral rights are involved in the project and how, when, and for what term the project would secure such rights under existing legislation and regulations.

6. Prevention of Future Pollution

Specify clearly and in-depth the State's provisions for legal and practical protection to demonstration areas, which will assure the prevention of future mine drainage pollution from any areas outside the

proposed project site which would affect the beneficial results of the project. Show how such protection will be achieved under existing authority for the duration of the proposed project as well as for the post-demonstration project period.

B. INVENTORY AND FORECAST

Analyze physical, economic, and social conditions in the mine drainage abatement program area in sufficient detail to generate the data required for planning, implementation, and operation activities. Physical conditions define the site, surface and subsurface, and provide constraints on the abatement systems selected. The inventory of water resources defines pollution sources and levels in the project area and that affected by it. Social and economic analysis will provide the basis for forecasting water demands and evaluating beneficial effects.

1. Physical Conditions

Determine the location of the project watershed and its relevant features on U. S. Geological Survey 7 1/2' topographic maps. Complete surveys by ground parties or aerial photography, or both, if necessary. Show at least the following for the project watershed:

- a. Political jurisdiction such as county, municipality, borough, township, city, etc.
- b. Watershed boundary (surface and subsurface as appropriate).
- c. Location and official names of streams in watershed and of the receiving streams into which the watershed discharges.
- d. The minerals mined and, by mineral, the area of mineral to be owned, leased or otherwise controlled by the project and whether mined or unmined.
- e. The name, type of mine, status, and surface areas mined and affected by surface mining.
- f. The location of surface subsidence areas resulting from underground mining.

- g. The name, type and status of deep mine, location of mine openings, and mine discharges, and maps of mined areas.
- h. The location of interconnections between adjacent deep as well as surface mines.
- i. The location of gas, oil, and water wells and levels of producing formations of each.
- j. The location of boreholes and elevation of mineral seams.
- k. Subsurface geology indicated from boreholes and other sources.
- l. The location of geologic faults.
- m. Location of any surface or subsurface water impoundment.
- n. An analysis of the materials remaining that could contribute to mine drainage pollution.

Discuss whether the physical information on the project watershed gained from the foregoing survey is adequate for the project. Show what is the effect on the project of inadequacies or inaccuracies in the foregoing and how the proposed project can compensate for such.

2. Water Resources

The quantity and quality of surface and subsurface water in the watershed must be known as well as the quality and quantity of existing mine drainage. As the rainfall affects both of the foregoing, such information is also desired seasonally. The following information should be shown for the project watershed:

- a. The mean low, mean, mean high and high flow for 10 year period for each stream as well as seasonal variations in mean flow.
- b. Mean flow seasonally (at least one year) for each mine discharge.
- c. Annual withdrawals from any water wells and, if available, any record of variation in water table.

- d. Seasonal quality of water in streams and wells with particular attention to those parameters reflecting mine drainage pollution as well as those covered by relevant stream standards.
- e. Seasonal quality of mine drainage discharges with emphasis on those parameters causing pollution in receiving streams and subject to alteration by the proposed demonstration project. This shall include an analysis for acidity or alkalinity, pH, COD, suspended solids, dissolved solids, and significant cations and anions.
- f. Seasonal rainfall data including 10 year and one hour maximum rainfall.

Discuss the sources of the water resource data and its adequacy for the project. Show how the project can compensate for inadequacies or inaccuracies in the foregoing.

3. Social and Economic Environment

State the population and major industrial units and their distribution in the watershed area and in the downstream adjacent areas. Project the probable changes in such social and economic environment for the areas concerned.

Determine the water requirements, quality and quantity, for municipal, industrial, recreational, agricultural and power uses in the watershed and in the adjacent downstream area.

Discuss the changes that the social and economic environment will cause in utilization of the water resources of the areas concerned. Show whether the proposed mine drainage control project will aid in meeting these requirements and also show what changes in water utilization will be affected by the project.

C. PRELIMINARY ENGINEERING

Give sufficient details of the proposed mine drainage abatement methods, their application to the proposed site, their capital and operating costs, and their past use so that their effectiveness and the means of implementation and operation can be clearly determined.

It must also be clearly shown that the proposed project will fulfill its purpose of demonstrating one or more workable mine drainage pollution abatement or control methods. It is not a research project with only problematical prospects of success. Examples of information desired are given under each of the following headings. Additional information should be supplied whenever relevant.

1. Abatement Method Description

Describe each abatement or control method employed including the principle of operation. Give the supporting past pilot or field experience, the mine drainage control effected by the application, and the interrelation between methods when more than one is proposed.

2. Design (Preliminary)

a. Drawings

Show in appropriate drawings and maps the following:

- (1) The location and outline of the proposed abatement or control methods and the existing mine drainage abated or controlled by each.
- (2) The points at which remaining drainage or treated discharge will occur and the course taken by such to the stream or streams in the watershed.
- (3) Topography of the watershed after project construction.
- (4) In the case of treatment methods
 - (a) Process flow sheet from point of collection through process to discharge.
 - (b) General location plan with controlling dimensions, grades and elevations.
 - (c) Plan and profiles of major units on process flow sheets.

- (5) In the case of mine sealing
 - (a) The location of seals and grout curtains to be constructed.
 - (b) The method of construction of the seals and curtains.
 - (c) The extent of flooding of the mined out area including elevation of pool surface.
- (6) In the case of backfilling
 - (a) The profile of the completed backfill including its relation to the cut, spoil bank, seam top and bottom, and previous natural contour.
 - (b) The contour plan of the completed backfill and adjacent areas.
- (7) In the case of stream diversion
 - (a) The plan and profile of streams after diversion.
 - (b) The cross sections of the diverted channel.
- (8) In the case of revegetation, the contour and plan of the revegetated area.

b. Specifications

State at least the following for each of the relevant abatement or control methods:

- (1) The maximum, minimum, and average design drainage flows and quality to be handled by treatment methods.
- (2) The unit dimensions, capacities, and materials for each flow sheet component for treatment methods.
- (3) Materials of construction of seals, grout curtains and diversion channels.

- (4) Composition of soils used in backfilling, top grading, and revegetation.
 - (5) Volume and method of movement of soils in backfilling and top grading.
 - (6) Minimum, mean, and 10 year maximum flows in diverted stream channels.
 - (7) Types and sizes of plantings and seedings, distribution, density, and estimated survival.
 - (8) Soil preparation including amount and type of soil additives or fertilizer.
 - (9) Method of planting or seeding.
- c. Expected Mine Drainage Water Quality and Quantity
- (1) Minimum, average, and maximum values for quantity of discharge, if any, from each control method and from watershed including brines, residues, and sludges.
 - (2) Average and maximum values for each quality parameter including all those required for effluent or stream standards for all discharges, if any, from each control method, from the watershed, and including brines, residues and sludges.
 - (3) Analysis of the feedwater if treatment methods are proposed.
- d. Design and Construction Schedules
- Give the planning, design, construction, start-up and operating schedule. Include also the operation schedule for the post-demonstration period.
- e. Program Surveillance Measures
- State the types of results and the means by which the results are accumulated and evaluated during the demonstration and post-demonstration period. Such results must include costs as

well as quantitative and qualitative performance of the project.

f. Program Emergency Procedures

State the significant emergency events that may occur during the life of the project and show both the impact on the project effectiveness and what measures are planned to correct or prevent such emergencies.

3. Capital and Operating Costs

a. Site Acquisition Costs

Give all legal fees, purchase or lease costs for land, minerals, and for water rights.

b. Construction Costs

Give all costs of equipment purchases as well as construction costs, and engineering fees.

c. Operating Procedures

Give administrative, purchasing, as well as operating and maintenance procedures during both demonstration and post-demonstration periods. Give quantities of supplies required.

d. Personnel Requirements

Give requirements for administrative, operation, and maintenance personnel, including job description, experience level, and expected compensation range.

e. Operating Costs

Give costs of operation and maintenance for both personnel, supplies, and utilities. Include allowances for purchasing, administration, and surveillance.

D. EFFECTIVENESS OF PROJECT

Projects which provide the most effective demonstrations of important abatement methods will be considered under the demonstration grants program. All demonstration and other public benefits which can be attributed to the

project must be identified and presented in an orderly manner for evaluation.

1. Demonstration Value

Provide the following measures of project effectiveness:

- a. The proportion of mine drainage pollution in the State or area which might be abated by the project.
- b. The proportion of mine drainage pollution which will be abated at the project site.
- c. The approximate unit cost of abatement in dollars per thousand gallons of polluted discharge to be abated.
- d. Annualized capital and operating costs per ton of mine drainage pollutants removed. For acid mine drainage, this should be dollars per ton of acid.
- e. The extent of streams and/or lakes to be improved, and the degree of improvement by the project.

2. Public Benefits

The public benefits of the project must be stated and discussed in terms of the location of the project relative to population concentrations, the visibility of the project and of the improved water quality and the extent of public interest in the quality of the receiving waters. The following must be included:

- a. Increased recreation opportunity.
- b. Increased industrial activity.
- c. Increased agricultural activity.
- d. Aesthetic improvement.
- e. Improved habitat for fish and wildlife.
- f. Compliance with quality standards.

- g. Income from sales of water.
- h. Reduced costs for water users.

E. PREPARATION OF IMPLEMENTATION AND OPERATING PLANS

Plans and schedules must be developed for the implementation and operation of the proposed mine drainage abatement demonstration project in addition to those discussed under Preliminary Engineering, Section 3C. These plans must include the schedules of required action by the responsible agencies as given in Section 3A, construction, operating and maintenance budgets and financial programs identifying sources of funds. Present the following information:

1. Project responsibility and schedules for acquisition, design, construction, operation and surveillance.
2. Project operation and maintenance budget for demonstration and post-demonstration periods.
3. Financing plan and schedule.
4. Procedures and schedule for providing required project personnel.
5. Plans for supervision of the entire project including the post-demonstration period.
6. Names and qualifications of the proposed Project Director and other principle personnel and their authority to act. Personnel biographical information should include title, degrees, and experience pertinent to the project.
7. Responsibility for and schedule for project progress reports and final project evaluation report. The final evaluation report should include an appraisal of the effectiveness of the project as accomplished versus that as originally estimated.

SECTION 4

FORMAT AND CONTENTS OF FEASIBILITY STUDY

Section 3 of this manual contains the typical major items that should be included in conducting a feasibility study to demonstrate methods for controlling pollution from mine drainage under Section 14 of the Federal Water Pollution Control Act as amended. All feasibility studies will be presented in the same format for ease of review by the Federal Water Quality Administration when processing applications for demonstration grants.

A typical feasibility report will contain the following items, realizing however, that common sense will dictate that all items may not necessarily apply to all studies.

1. Cover
2. Title Page
3. Table of Contents
4. List of Figures
5. List of Tables
6. Body of Report
 - a. Introduction
 - (1) Scope and Purpose of the Project
 - (2) General Description of the Project
 - (3) Effectiveness of Project
 - b. Jurisdictional Framework
 - (1) Authority
 - (2) Standards
 - (3) Site Acquisition
 - (4) Funding Authority
 - (5) Water and Mineral Rights
 - (6) Prevention of Future Pollution
 - c. Inventory and Forecast
 - (1) Physical Conditions
 - (2) Water Resources
 - (3) Social and Economic Environment
 - d. Preliminary Engineering
 - (1) Abatement Project Description
 - (2) Preliminary Design
 - (3) Capital and Operating Costs
 - e. Implementation and Operating Plan
7. Acknowledgments
8. References
9. Glossary of Terms, Abbreviations and Symbols
10. Appendices

APPENDIX A

PREFEASIBILITY PLANNING

The conduct of a feasibility study for the application of a proposed mine drainage pollution control method or combination of methods to a proposed watershed may involve considerable effort and expense for the State or interstate agency concerned. It is foreseen that such States or agencies that desire to participate in the Demonstration Program will want to conduct a prefeasibility study at a much reduced level of effort in order to select a watershed and an abatement or control program for it that will be consistent with the overall Demonstration Program of the Federal Water Quality Administration.

Prefeasibility planning is an iterative process involving a survey of potential watersheds, demonstratable methods, selection of proposed watershed and method combinations, and fitting of alternatives into the overall FWQA Demonstration Program. The following tasks in the prefeasibility study may be initiated in any sequence, however, all steps should be undertaken before commencing effort on the feasibility study itself.

1. Identify Existing Watersheds with Mine Drainage Pollution in the State or Region Suitable for a Demonstration Project. Particular attention should be given to the following:
 - a. Existence of proper authority to acquire the sites, conduct the study, conform to stream standards, and to prevent future pollution at the site.
 - b. Existence of information on the type and magnitude of mine drainage pollution in the watershed and its effects on the watershed and its adjacent downstream areas.
 - c. The possible abatement or control methods that would need to be employed in the watershed.
 - d. The effectiveness of a demonstration project at the site as measured by the amount of mine drainage abated and by the enhancement of the present and potential public uses of the water in the watershed and in adjacent downstream areas.

2. Identify Demonstratable Mine Drainage Pollution Abatement or Control Methods. Attention should be given to the following:

- a. Methods for which there is adequate prior experience in pilot or full scale operation to assure a very high probability of success when properly applied.
- b. The size and type of site or quantity and quality of flows required to demonstrate the engineering and economic feasibility and practicality of the abatement or control method.
- c. Effectiveness of the method in abating or controlling mine drainage, and the quality of any discharges including residues.
- d. The approximate capital and operating costs of the method.

3. Selection of Candidate Demonstration Projects

Based upon the general inventory of demonstratable watersheds and abatement or control methods, select one or two combinations that appear feasible and establish approximate estimates of project costs and the project time schedule.

4. Fitting of Demonstration Project Alternatives into the FWQA Mine Drainage Abatement Demonstration Project Program

In a national program, it is expected that many proposals for similar projects will be received and that the sum of all those received may not adequately cover the full scope of the national program. Other considerations of priority and funding also will exist that will enter in the selection of the proposals for actual demonstration from those submitted. The State or interstate agency should thus meet with the FWQA to determine general interest in those projects the agency proposes or to determine those types of projects for which proposals may be desired by the FWQA.

APPENDIX B

FORMAT OF APPLICATION FOR SECTION 14 DEMONSTRATION GRANT

The Water Quality Improvement Act of 1970 includes a portion entitled "Area Acid and Other Mine Water Pollution Control Demonstrations" which will be administered by the Federal Water Quality Administration. Application for a grant under Section 14 to demonstrate methods for the elimination or control of acid or other mine water pollution may be made through the FWOA Research, Development, and Demonstration Grant Program.

This Appendix includes the application form No. 211 (Rev. 3-69), and the "Instructions for Completing Applications For Section 14 Demonstration Grants."

INSTRUCTIONS FOR COMPLETING APPLICATIONS FOR
SECTION 14 DEMONSTRATION GRANTS

Office of Research and Development
FEDERAL WATER QUALITY ADMINISTRATION
July, 1970

INSTRUCTIONS FOR COMPLETING APPLICATIONS FOR
SECTION 14 DEMONSTRATION GRANTS

General Information

A grant application kit for Section 14 projects may be requested from:

Project Coordination
Office of Research and Development
Federal Water Quality Administration
U. S. Department of the Interior
Washington, D. C. 20242

Review the following information contained in the grant application kit for Section 14 projects before preparing an application:

- a. Feasibility Manual for Mine Water Pollution Control Demonstrations.
- b. Rules and Regulations for Research, Development, and Demonstration Grants.
- c. Patents and Inventions Article.
- d. Clean Water Fact Sheets.

Submission of Application

Submit an original and 7 copies of each application and one acknowledgement card to Project Coordination, FWQA.

Acknowledgement by FWQA

The applicant shall complete the acknowledgement card and attach the card to the original grant application. The card showing the date of receipt will be returned to the applicant.

PART I, SECTION A, REQUEST AND CERTIFICATIONS

1. Type of Grant

Omit - This does not apply to Section 14 grants.

2, 3, and 4. Self-explanatory.

5. Grant Director

The Grant Director is the person who has been assigned responsibility for overall direction and management of the project for the applicant. He must be an officer or employee of the applying organization.

6. Project Director

The Project Director is the person who has been assigned responsibility for the technical supervision of the project. The Project Director and Grant Director responsibilities may be assigned to one person if desired.

7. Self-explanatory.

8. Type of Application

New - A project not previously supported by an FWQA grant -
Indicate yes or no Section 14.

Revision - An existing grant project requiring additional funds or other changes for completion within the grant period.

Continuation - An existing grant project requiring additional time and funds or other changes for completion.

Where the application is for a revision or a continuation, insert the original FWQA Grant Number.

9. Project Financing

a. For Total Project:

Total Project Period - estimated beginning and ending dates for entire project.

Total Project Cost - estimated total cost for entire project.

b. For this Request*:

Grant Period - estimated beginning and ending dates of activity to be financed by requested grant.

* Section 14 grants are normally made for the total project period. Continuation grants for additional grant periods are subject to availability of appropriated funds and successful development of the project.

Applicant's share - project costs to be paid by
applicant during grant period.
Grant Requested - self-explanatory
Total - applicant's share plus grant requested.

10. Terms and Conditions

The signature must be in ink. Attach certified copy of
authorization made by the applicant's governing body
authorizing the signer to apply for a grant.

PART I, SECTION B, SUMMARY DESCRIPTION OF PROJECT

Self-explanatory

PART I, SECTION C, APPROVAL BY STATE
WATER POLLUTION CONTROL AGENCY

Omit - This does not apply to Section 14 grants.

PART I, SECTION D-1, FINANCIAL SUMMARY

1. Estimated Project Costs During Grant Period

- A. thru J. - The amounts shown for each Budget Category
are to be taken from Part I, Section D-2, FINANCIAL
DETAIL. The first column should indicate the total
funds required for each budget category during the
grant period. The second column should indicate the
grant funds being requested for each item. Show the
totals of items A. thru I. in the appropriate space.
- J. Indirect Costs - Indirect costs, as described in Bureau
of the Budget Circular No. A-21 (Revised), are those
costs which, because of their nature, are normally not
identified with specific or individual projects. A
grantee's general and administrative costs such as per-
sonnel management, accounting, purchasing, and normal
maintenance and protection of the grantee's facilities
are examples of indirect costs and shall not be charged
as direct costs unless, because of special circumstances,
an exception is specifically approved in advance by the
FWQA.

Indirect cost rates are established in one of the fol-
lowing ways: (1) by a previous Government agency audit,
(2) by the applicant's own cost accounting practices, or

(3) by special computation for the grant project. The latter two methods will require approval based upon Government audit, but a provisional rate may be used until an audit is performed. In these cases, provide a detailed computation on a separate sheet to show how the proposed provisional rate is determined. In no instance may indirect cost rates be applied to contract expenditures for consultants, equipment, other contracts, or construction. Enter cost in the appropriate space.

- K. thru S. - The amounts shown for each Budget Category are to be taken from Part I, Section D-2, FINANCIAL DETAIL. The first column should indicate the total funds required for each budget category during the grant period. The second column should indicate the grant funds being requested for each item. Show the totals of items K. thru S. in the appropriate space and the total project costs (A. thru S.) where indicated.

2. Proposed Funding

- A. Applicant's Share - Cost sharing is required for all grant projects. The minimum share of the total project cost to be borne by the applicant is 25 per centum. One factor which will be considered in the evaluation of a proposed project is the share of project costs which the Applicant proposed to bear above the minimum share required.

The applicant's share of the total project cost may include:

1. Land

- a. Cost if purchased in fee by State or interstate agency.
- b. Cost of easement, if obtained by State or interstate agency.
- c. Assessed evaluation of lands already owned by State or donated to State or interstate agency.
- d. Lease cost.

2. Mineral Rights, cost if obtained by the State or interstate agency.
3. Services, cost incurred in preparation of Feasibility Study Report.
4. Material and Equipment
 - a. Current amortized value of dedicated equipment.
 - b. Reasonable rental value (short duration).

B. Self-explanatory.

C. Total - The sum shall be equal to the total Project Costs (A. thru S.).

3. Support to be Used for the Project

Identify the support by source and date available. If an election is required for issue of bonds or levy of taxes, etc., state results and date if held, or plans and proposed date if not yet held.

PART I, SECTION D-2, FINANCIAL DETAIL
RESEARCH/DEVELOPMENT/DEMONSTRATION STUDIES

The estimate of funds required shall be as accurate as circumstances permit. Where the project is incorporated with and only a portion of a larger project, such as a public works project, only the costs relating to the smaller project shall be listed. Where requested information is not applicable, insert N.A. in the space provided.

- A. Salaries and Wages - Name principal personnel to be engaged on the project and other personnel (by number of employees). Where applicable provisions of Bureau of the Budget Circular A-21 (Revised), Section B 7, Stipulated Salary Support, shall be included relating to professorial staff support.
- B. Fringe Benefits - Name principal personnel and number of other personnel to be engaged on the project; and opposite each, list the types, basis of computation, and amount of fringe benefit costs for this project. This section is to be utilized only if the applicant's established policies treat fringe benefits as direct costs.

2. Mineral Rights, cost if obtained by the State or interstate agency.
3. Services, cost incurred in preparation of Feasibility Study Report.
4. Material and Equipment
 - a. Current amortized value of dedicated equipment.
 - b. Reasonable rental value (short duration).

B. Self-explanatory.

C. Total - The sum shall be equal to the total Project Costs (A. thru S.).

3. Support to be Used for the Project

Identify the support by source and date available. If an election is required for issue of bonds or levy of taxes, etc., state results and date if held, or plans and proposed date if not yet held.

PART I, SECTION D-2, FINANCIAL DETAIL
RESEARCH/DEVELOPMENT/DEMONSTRATION STUDIES

The estimate of funds required shall be as accurate as circumstances permit. Where the project is incorporated with and only a portion of a larger project, such as a public works project, only the costs relating to the smaller project shall be listed. Where requested information is not applicable, insert N.A. in the space provided.

- A. Salaries and Wages - Name principal personnel to be engaged on the project and other personnel (by number of employees). Where applicable provisions of Bureau of the Budget Circular A-21 (Revised), Section B 7, Stipulated Salary Support, shall be included relating to professorial staff support.
- B. Fringe Benefits - Name principal personnel and number of other personnel to be engaged on the project; and opposite each, list the types, basis of computation, and amount of fringe benefit costs for this project. This section is to be utilized only if the applicant's established policies treat fringe benefits as direct costs.

- N. Construction - Materials - Cost of materials and equipment to be used in the construction portion of the project and to be furnished by the applicant shall be detailed here. Indicate whether the equipment will be purchased, rented, or furnished by the applicant. If furnished by the applicant, give details on computation of use allowance requested on separate sheets. If construction work, or a portion thereof, will be performed by the applicant's personnel, include "Force Account" in this category and give details (number of persons, time or effort, payroll costs). Provide a total of estimated costs for this category. Documented justification for purchase of equipment related to this project must be available for audit purposes. Do not duplicate any cost included in item D.
- O. thru S. Self-explanatory. These items refer to the technical services and operation and maintenance activities associated with the construction facilities phase of the project.

PART I, SECTION E, PROJECT SCHEDULE

1. Data on Contracts

If any contracts have been let which will involve project funds, so indicate. This includes feasibility studies, construction, engineering services, land acquisition, etc.; the listing should include the purposes of the contracts, name of contractors, and date of contracts. A copy of any contract already let should be submitted with the application.

2. Schedule

Self-explanatory.

PART II, DETAILED PROJECT DESCRIPTION AND SUPPORTING INFORMATION

PART II, SECTION A of the application shall include the Feasibility Study Report prepared in accordance with the Feasibility Study Manual for Mine Water Pollution Control Demonstrations. PART II, SECTION B of the application shall list all active research, development, and demonstration projects in which the proposed Project Director is engaged. For each project, the following shall be identified:

- a. Supporting agency or organization
- b. Grant or contract number
- c. Title of project
- d. Time (hours) or effort (percent of total working time)
of the Project Director
- e. Estimated project costs
- f. Project period with dates

Identify any other agencies or organization to which this application has been submitted.

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
WASHINGTON, D. C. 20242

APPLICATION FOR
RESEARCH, DEVELOPMENT, AND DEMONSTRATION GRANT

FWPCA USE ONLY

PROGRAM NO.

ACCOUNT NO.

DATE RECEIVED:

PART I, SECTION A, REQUEST AND CERTIFICATION

1. TYPE OF GRANT
☐ CLASS I: RESEARCH ☐ CLASS II: DEMONSTRATION ☐ CLASS III: STORM & COMBINED SEWER ☐ CLASS IV: ADVANCED WASTE TREATMENT ☐ CLASS V: INDUSTRIAL WASTE

2. TITLE OF PROJECT

3. APPLYING ORGANIZATION AND MAILING ADDRESS (ZIP Code)

8. TYPE OF APPLICATION ("X" appropriate box)

NEW

REVISION (TO):

FWPCA GRANT NO:

CONTINUATION (OF):

4. PROJECT LOCATION AND MAILING ADDRESS (ZIP Code)

9. PROJECT FINANCING

a. FOR TOTAL PROJECT:

TOTAL PROJECT PERIOD: (FROM) (THROUGH)

5. GRANT DIRECTOR: MAILING ADDRESS (ZIP Code) AND TELEPHONE NO.

TOTAL PROJECT COST: \$

b. FOR THIS REQUEST:

GRANT PERIOD: (FROM) (THROUGH)

APPLICANT'S SHARE: \$

GRANT REQUESTED: \$

TOTAL: \$

6. PROJECT DIRECTOR: MAILING ADDRESS (ZIP Code) AND TELEPHONE NO.

FWPCA USE ONLY

APPROVED PROJECT PERIOD

FROM

THROUGH

7. FINANCIAL OFFICER (To Receive Grant Funds), MAILING ADDRESS (ZIP Code) AND TELEPHONE NO.

APPROVED ESTIMATED PROJECT COST

APPLICANT'S SHARE \$

GRANT REQUESTED \$

TOTAL \$

10. TERMS AND CONDITIONS

The attached statements and exhibits are hereby made part of this application and the undersigned representative of the Applicant certifies that the information in the application and in the attached statements and exhibits is true, correct, and complete to the best of his knowledge and belief. He further certifies that: He has been authorized to file this application by formal action of the governing body of the Applicant as is evidenced by the ATTACHED CERTIFIED COPY OF AUTHORIZATION MADE BY THE APPLICANT'S GOVERNING BODY; the governing body of the Applicant agrees that if a Federal grant for the Project is made on the basis of this application or on the basis of any provision or amendment thereof, it will comply with all of the applicable requirements and conditions of the regulations governing grants for water pollution control authorized by the Water Pollution Control Act, as amended (33 U.S.C. 466 et. seq.) and with such additional conditions as the Commissioner may impose prior to or at the time of the grant award.

SIGNATURE OF PERSON AUTHORIZED TO SIGN

DATE

TITLE:

PART I, SECTION B, SUMMARY DESCRIPTION OF PROJECT

GIVE A BRIEF DESCRIPTION OF THE PROJECT, SUMMARIZING THE PROJECT OBJECTIVES AND PLAN OF OPERATION DESCRIBED IN THE DETAILED PROJECT PLAN (PART II, SECTION A). *(Limit the summary to the space provided)*

PART I, SECTION C, APPROVAL BY STATE WATER POLLUTION CONTROL AGENCY *(If applicable)*

TITLE OF PROJECT

GRANT APPLICANT

The project described above, if carried out in accordance with the proposed plan of operation, is hereby approved.

NAME OF OFFICIAL STATE WATER POLLUTION CONTROL AGENCY

SIGNATURE OF RESPONSIBLE OFFICER

TITLE OF OFFICER

DATE

PART 1, SECTION D-1, FINANCIAL SUMMARY

1. ESTIMATED PROJECT COSTS DURING GRANT PERIOD

ITEM	PROPOSED BY APPLICANT		FWPCA USE ONLY	
	TOTAL FOR GRANT PERIOD	GRANT REQUESTED	ELIGIBLE COSTS	FWPCA OFFER
A. SALARIES AND WAGES				
B. FRINGE BENEFITS				
C. CONSULTANT SERVICES				
D. EQUIPMENT				
E. SUPPLIES				
F. TRAVEL				
G. PUBLICATION COSTS				
H. OTHER				
I. CONTRACTS				
TOTAL DIRECT COSTS (A thru I)				
J. INDIRECT COSTS ()				
TOTAL R/D/D STUDIES (A thru J)				
K. CONSTRUCTION-ENGINEERING PLANS				
L. CONSTRUCTION - SUPERVISION				
M. CONSTRUCTION - CONTRACTS				
N. CONSTRUCTION - MATERIALS				
TOTAL CONSTRUCTION (K thru N)				
O. OPERATION - SALARIES & WAGES				
P. OPERATION - FRINGE BENEFITS				
Q. OPERATION - SUPPLIES				
R. OPERATION - UTILITIES				
S. OPERATION - REPAIRS				
TOTAL OPERATION (O thru S)				
TOTAL FACILITIES (K thru S)				
TOTAL PROJECT COSTS (A thru S)				

PART I, SECTION D-1, FINANCIAL SUMMARY (Continued)

2. PROPOSED FUNDING

ITEM	PROPOSED BY APPLICANT		FWPCA USE ONLY	
	PERCENT	FUNDS	PERCENT	FUNDS
A. APPLICANT'S SHARE		\$		\$
B. GRANT REQUESTED				
C. TOTAL	100	\$	100	\$

3. SUPPORT TO BE USED FOR THE PROJECT

ITEM	DATE AVAILABLE	AMOUNT
A. CASH		\$
B. GENERAL OBLIGATION BONDS		
C. REVENUE BONDS OR CERTIFICATES		
D. OTHER (Specify)		
E. ANTICIPATED FWPCA GRANT		
F. TOTAL		\$

REMARKS

PART I, SECTION D-2, FINANCIAL DETAIL - RESEARCH/DEVELOPMENT/DEMONSTRATION STUDIES

	NAME	POSITION	PROFESSION OR SKILL	ANNUAL SALARY	TIME ON PROJECT (% or hrs)	COST
A. Salaries and Wages						\$
						TOTAL A \$
B. Fringe Benefits	NAME	TYPES OF BENEFITS (Social Security, Group Life Insurance, Retirement, etc.)				\$
						TOTAL B \$
C. Consultant Services	CONSULTANT (if known)	SERVICES TO BE PERFORMED				\$
						TOTAL C \$
D. Equipment	ITEM	HOW OBTAINED (purchase, rental, furnished by applicant)				\$
						TOTAL D \$
E. Supplies	ITEM	HOW OBTAINED (as in D. above)	QUANTITY	UNIT COST		\$
						TOTAL E \$

PART I, SECTION D-2, FINANCIAL DETAIL - RESEARCH/DEVELOPMENT/DEMONSTRATION STUDIES (Cont.)					
	TRAVELER	DESTINATION AND PURPOSE	NO. OF TRIPS	COST PER TRIP	COST
F. Travel					\$
					TOTAL F \$
G. Publication Costs	ITEM	PURPOSE			\$
					TOTAL G \$
H. Other	ITEM	PURPOSE			\$
					TOTAL H \$
I. Contracts	LIST ANTICIPATED CONTRACTS BY PURPOSE, PROBABLE CONTRACTOR IF KNOWN, AND ESTIMATED COST				\$
					TOTAL I \$
J. Indirect Costs	LIST RATE, BASE OF COMPUTATION, AND NEGOTIATING AGENCY				\$
					TOTAL J \$
PART I, SECTION D-2, FINANCIAL DETAIL - FACILITIES					
K. Construction - Engineering Plans					\$
					TOTAL K \$

PART I, SECTION D-2, FINANCIAL DETAIL - FACILITIES

L. Construction - Supervision		\$
		TOTAL L
		\$
M. Construction - Contracts		\$
		TOTAL M
		\$
N. Construction - Materials		\$
		TOTAL N
		\$

PART I, SECTION D-2, FINANCIAL DETAIL - FACILITIES

P.	Operation - Salaries and Wages	LIST NUMBER OF EMPLOYEES BY SKILLS, ANNUAL SALARIES, AND TIME ON PROJECT BY % OR HOURS				\$
						TOTAL O \$
P.	Operation - Fringe Benefits	LIST BY GROUPS NAMED IN 'O' ABOVE (Social Security, Group Life Insurance, Retirement, etc.)				\$
						TOTAL P \$
Q.	Operation - Supplies	ITEM	HOW OBTAINED	QUAN- TITY	UNIT COST	\$
						TOTAL Q \$
R.	Operation - Utilities	ITEM			QUANTITY	\$
						TOTAL R \$
S.	Operation - Repairs	LIST MAJOR ITEMS OF EQUIPMENT AND FACILITIES REPAIR, AND ESTIMATED COSTS				\$
						TOTAL S \$

PART I, SECTION E, PROJECT SCHEDULE

1. DATA ON CONTRACTS

A. HAVE ANY CONTRACTS BEEN AWARDED?

☐ YES

☐ NO

B. IF YES, LIST THOSE AWARDED (Give purpose of contract, name of contractor, and date awarded)

2. APPLICANT IS PREPARED TO MAINTAIN THE FOLLOWING SCHEDULE

(Not applicable to Class I Grants)

ITEM	NUMBER OF CALENDAR DAYS
A. DAYS REQUIRED TO COMPLETE PRELIMINARY STUDIES, AFTER GRANT OFFER IS ACCEPTED:	
B. DAYS REQUIRED TO COMPLETE ENGINEERING REPORT FOR PROPOSED PROJECT, AFTER GRANT OFFER IS ACCEPTED:	
C. DAYS REQUIRED FOR PLANS AND SPECIFICATIONS TO BE READY FOR ADVERTISING FOR BID, AFTER GRANT OFFER IS ACCEPTED:	
D. DAYS REQUIRED TO LET CONTRACT FOR CONSTRUCTION, AFTER GRANT OFFER IS ACCEPTED:	
E. ESTIMATED TIME TO COMPLETE CONSTRUCTION AND INITIATE POST-CONSTRUCTION STUDIES:	
F. ESTIMATED TIME REQUIRED FOR POST-CONSTRUCTION STUDIES:	
G. ESTIMATED TIME REQUIRED AFTER POST-CONSTRUCTION STUDIES FOR PREPARATION OF A FINAL TECHNICAL REPORT TO EVALUATE FINDINGS:	

PART II, DETAILED PROJECT DESCRIPTION

(Part II of the application shall provide a detailed description of the project plan, supporting information, and miscellaneous information. The description shall be prepared in accordance with the Instructions for completing Part II to assist in the review of this application. Begin here and use continuation pages as necessary.)

Section A, PROJECT PLAN

quickly as possible to lessen the incidence of pollution; partial or complete backfilling of the surface mine to cover acid-forming materials; establishing a vegetative cover that will reduce runoff and erosion; and establishing impoundments which both inundate the sulfide materials eliminating further acid-forming reactions and reestablish water resources in the area.

Considerable research is presently being performed on various ways to prevent pollution from abandoned underground mining. One measure which has been somewhat successful is the sealing of the deep mine to flood all exposed surfaces. Flooding stops further oxidation of the sulfide minerals consequently eliminating further formation of the pollutant materials in the remaining drainage. The sealing may also abate mine drainage completely by retaining all water in the mine.

Other measures that have been applied to prevent pollution from abandoned deep mines include: sealing to prevent the access of fresh air to the mine, diversion of surface waters from entering underground mines, and rapid removal of drainage within the mine before it becomes contaminated.

The typical at-source control measures outlined above have been successful on a limited basis and are generally applicable only to abandoned mines.

For those situations where at-source control will not be effective, various methods for treatment of the mine drainage may be applicable. Neutralization of acid mine drainage has been extensively used by the coal mining industry to comply with State regulations³. Lime is the most commonly used compound for neutralizing acidity. This treatment process generally consists of adding and mixing the alkaline compound with the drainage, aeration of the drainage if ferrous iron is present, and removal of the resulting sludge in a mechanical facility or earthen settling ponds. Methods for final disposal of the sludge include burial in the settling pond, removal to another location for burial, discharge into abandoned deep mine workings, or use of more sophisticated methods to lessen

³Heine, Walter N., and Giovannitti, Ernest F., "Treatment of Mine Drainage by Industry in Pennsylvania," Journal of the Sanitary Engineering Div., ASCE, Vol. 96, No. SA3, Proc. Paper 7362, June 1962, pages 743-755.

its volume by dewatering or drying such as drying beds or vacuum filters.

Neutralization removes the acidity, precipitates most heavy metals from mine drainage, and produces a treated water which usually will support the propagation of aquatic life. Such water, however, is generally not suitable for potable or industrial use without further treatment. Other more advanced technological processes exist for producing high quality water from mine drainage. Several of these have been sufficiently tested on mine drainage to prove their applicability or to substantiate the installation of a full sized unit. These processes presently include reverse osmosis, ion exchange, and (MFS) distillation.

BLANK PAGE

APPENDIX D

TYPICAL DATA SOURCES

1. Water Resources and Stream Quality Information

A. Federal Agencies

United States Department of the Interior, Federal Water Quality Administration, Crystal Mall, Building 2, 1921 Jefferson Davis Highway, Arlington, Virginia, Telephone (703) 557-7449

Regional Offices

United States Department of the Interior, Federal Water Quality Administration, 33 E. Congress Parkway, Room 410, Chicago, Illinois 60605, Telephone (312) 353-5250

United States Department of the Interior, Federal Water Quality Administration, 918 Emmet Street, Charlottesville, Virginia 22901, Telephone (703) 296-1376

United States Department of the Interior, Federal Water Quality Administration, 911 Walnut Street, Room 702, Kansas City, Missouri 64106, Telephone (816) 374-5493

United States Department of the Interior, Federal Water Quality Administration, John F. Kennedy Federal Building, Room 2303, Boston, Massachusetts 02203, Telephone (617) 223-7210

United States Department of the Interior, Federal Water Quality Administration, Room 501, Pittock Block, Portland, Oregon 97205, Telephone (503) 226-3915

United States Department of the Interior, Federal Water Quality Administration, 4676 Columbia Parkway, Cincinnati, Ohio 45226, Telephone (513) 871-1820

United States Department of the Interior, Federal Water Quality Administration, 1402 Elm Street, Dallas, Texas 75202, Telephone (214) 749-2161

United States Department of the Interior, Federal
Water Quality Administration, 1421 Peachtree
Street, N. E., Suite 300, Atlanta, Georgia 30309,
Telephone (404) 562-5727

United States Department of the Interior, Federal
Water Quality Administration, 760 Market Street,
San Francisco, California 94102, Telephone (415)
556-4303

United States Department of Commerce, Environmental
Science Services Administration, Room 411, Building
5, Rockville, Maryland 20850

B. River Basin Commissions

Colorado River Board
909 S. Broadway
Los Angeles, California 90015

Columbia River Gorge Commission
920 N. E. 7th Avenue
Portland, Oregon 97232

Delaware River Basin Commission
25 Scotch Road
P. O. Box 360
Trenton, New Jersey 08603
Member States: Del., N. J., N. Y., Pa.

Great Lakes Commission
2200 N. Campus Boulevard
Ann Arbor, Michigan 48105
Member States: Ill., Ind., Mich., Minn., N. Y.,
Ohio, Wis., Pa.

Great Lakes - Upper Mississippi Board of State
Sanitary Engineers
State Board of Health
P. O. Box 309
Madison, Wisconsin 53701
Member States: Ill., Ind., Iowa, Mich., Minn.,
Mo., N. Y., Ohio, Pa., Wis.

Interstate Commission on the Potomac River
1025 Vermont Avenue, N. W.
Washington, D. C. 20005
Member States: D. C., Md., Pa., Va., W. Va.

Interstate Sanitation Commission
10 Columbus Circle
New York, New York 10019
Member States: Conn., N. J., N. Y.

Klamath River Compact Commission
P. O. Box 388
Sacramento, California 95802

Mississippi River Commission
P. O. Box 80
Vicksburg, Mississippi 39180

New England Interstate Water Pollution Control
Commission
73 Tremont Street
Boston, Massachusetts 02108
Member States: Conn., Me., Mass., N. H., N. Y.,
R. I., Vt.

New England River Basins Commission
55 Court Street
Boston, Massachusetts 02108

Ohio River Valley Water Sanitation Commission
414 Walnut Street
Cincinnati, Ohio 45202
Member States: Ill., Ind., Ky., Ohio, Pa., N. Y.,
Va., W. Va.

Pacific Northwest River Basins Commission
110 E. 13th Street
Vancouver, Washington 98660

Pecos River Commission
P. O. Box 123
Carlsbad, New Mexico 88220

Resources Advisory Board
Southeast River Basins Commission
Room 402
Walton Building
Atlanta, Georgia 30303

Souris - Red - Rainy River Basins Commission
Suite 6
Professional Center - Holiday Mall
Moorhead, Minnesota 56560

Upper Colorado River Commission
355 S. 4th East Street
Salt Lake City, Utah 84111

Yellowstone River Compact Commission
P. O. Box 1696
409 Federal Building
Helena, Montana 59601

2. Hydrologic Information

- A. United States Army Corps of Engineers
Chief of Engineers
Department of the Army
Washington, D. C. 20314

Divisional Offices

Huntsville
P. O. Box 1600 West Station
Huntsville, Alabama 35807

Lower Mississippi Valley
P. O. Box 80
Vicksburg, Mississippi 39180

Missouri River
P. O. Box 103 Downtown Station
Omaha, Nebraska 68101

New England
424 Trapelo Road
Waltham, Massachusetts 02154

North Atlantic
90 Church Street
New York, New York 10007

North Central
536 S. Clark Street
Chicago, Illinois 60605

North Pacific
210 Custom House
Portland, Oregon 97209

Ohio River
P. O. Box 1159
Cincinnati, Ohio 45201

South Atlantic
510 Title Building
30 Pryor Street, S. W.
Atlanta, Georgia 30303

South Pacific
630 Sansome Street
Room 1216
San Francisco, California 94111

Southwestern
1114 Commerce Street
Dallas, Texas 75202

- B. Geologic Survey
United States Department of the Interior
General Services Building
18th and F Streets, N. W.
Washington, D. C. 20242
Telephone (202) 343-1100

Field Offices in 46 States

3. Geologic and Topographic Information

- A. Geologic Survey
United States Department of the Interior
General Services Building
18th and F Streets, N. W.
Washington, D. C. 20242
Telephone (202) 343-1100

- B. United States Department of Agriculture
14th Street and Jefferson Dr., S. W.
Washington, D. C. 20250

Soil and Water Conservation Research Division
Plant Industry Station
Beltsville, Maryland 20705

Soil Conservation Service
Washington, D. C. 20250

Offices in 50 States

- C. American Geologic Institute
1444 N. Street, N. W.
Washington, D. C. 20005

4. Meteorologic Information

- A. World Data Center A
Meteorology
National Weather Record Center
Ashville, North Carolina 28801
- B. United States Weather Bureau
United States Department of Commerce
Gramax Building
8060 13th Street
Silver Spring, Maryland 20910

5. Mine Drainage Technology - Formation, Control, and Treatment

A. Mine Drainage Abstracts - A Bibliography

Prepared by: Bituminous Coal Research, Inc.
350 Hochberg Road
Monroeville, Pennsylvania 15146

For the: Coal Research Board
Commonwealth of Pennsylvania
Department of Mines & Mineral Industries
Harrisburg, Pennsylvania 17120

With the continuing interest in improving water quality in streams, a number of articles which relate to acid mine drainage have appeared in the current literature. The Pennsylvania Coal Research Board has underwritten a project at Bituminous Coal Research, Inc., to publish annual supplements to Mine Drainage Abstracts - A Bibliography.

A special library on Acid Mine Drainage established in 1961 at Bituminous Coal Research, Inc., under the sponsorship of the Coal Industry Advisory Committee to ORSANCO is the source of the Bibliography. This collection now contains approximately 1700 documents.

The complete abstracts of this Bibliography through 1969 is available from the Pennsylvania Coal Research Board at a cost of \$3.05.

- B. A Report by the Appalachian Regional Commission,
1969, to the President, "Acid Mine Drainage in
Appalachia"

Available from:

Appalachian Regional Commission
1666 Connecticut Avenue
Washington, D. C. 20235

BLANK PAGE

INDEX

Abatement

- Alternatives, 7
- Benefits, 9, 20, 25
- Costs, 20
- Effectiveness, 20
- Funds, 12
- Methods, 7, 15, 16, 25, 26
- Projects, 2, 5, 20
- Technology, 47

Administration, 6, 7, 9, 11, 19, 20, 21

Agency

- Authority, 7, 11, 12

Application

- Forms, 37-45
- Grants, 1
- Information, 1, 6, 10
- Instructions, 27-36

Backfill, 17, 48

Benefits, 9, 20, 26

Bore holes, 14

Condemnation, 12

Contracts, 35

Costs

- Administrative, 31
- Capital, 15, 19, 26
- Direct, 31
- General, 31
- Indirect, 31
- Operating, 15, 19, 26
- Project, 9, 18, 19, 26

Demonstration

- Project
 - Administration, 5, 19, 21
 - Alternatives, 1, 7, 11

Demonstration (cont.)

Project

- Benefits, 9, 20, 26
- Construction 5, 15, 19
- Costs, 9, 15, 18, 19, 26
- Development Process, 5, 6, 7, 25, 26
- Economics, 2, 9
- Effectiveness, 9, 15, 19, 20, 25, 26
- Emergencies, 19
- Engineering, 2, 9, 15, 17
- Feasibility, 2, 5, 9
- Financing, 30, 33-35
- Funds, 12, 20, 32
- Implementation, 7, 13, 15, 21
- Legality, 7, 9, 11
- Legislation, 1, 2, 3, 7, 9
- Location, 3, 5, 11
- Objective, 3, 16
- Operation, 5, 7, 13, 15, 21
- Personnel, 19, 20, 30
- Purpose, 2, 16
- Schedule, 18, 21, 35
- Selection, 3, 5, 7, 11, 25, 26
- Specifications, 17
- Surveillance, 3, 12, 18
- Value, 2, 3, 9, 20

Diversion, 17, 18, 48

Drainage

- Analyses, 15, 18
- Diversion, 17, 18, 48
- Quality, 15, 18
- Quantity, 15, 18, 47

Drawings, 13, 16, 17

Drill holes, 14

Easement, 12, 32

Effectiveness, 9, 15, 19, 20, 25, 26

Enforcement, 12

Engineering, 2, 3

- Preliminary, 9, 15
- Design, 17

- Environment, 9, 15
 - Economic, 9, 13, 15
 - Political, 9, 13
 - Social, 9, 13, 15
- Feasibility study, 2, 5, 7, 8, 11-21
 - Alternatives, 1
 - Cost, 33
 - Engineering, 3, 15
 - Format, 3, 7, 23
 - Inventory, 3, 5, 7, 13, 14
 - Drainage sources, 3
 - Uses, 3
 - Water resources, 13
 - Legislative requirements, 2
 - Preliminary to, 3, 25, 26
 - Purpose, 11, 16
 - Site selection, 3, 7, 11, 25, 26
- Flooding, 17, 48
- Flow
 - Drainage, 15, 17
 - Process, 16, 17
 - Stream, 14, 48
- Funds
 - State, 7, 12
 - Post-demonstration, 12, 18
- Geology, 14
- Grant, 1
 - Applications, 1, 9, 27-45
 - Evaluation, 1, 9, 19, 20
 - Funding, 12, 32-35
- Grout, 17
- Guidelines
 - Manual, 1-3, 6
 - Feasibility study, 8, 11-21, 23
- Holes, 13, 14
- Hydrology, 9, 14
- Inventory, 3, 5, 7, 13, 14, 25, 26
- Jurisdiction, 7, 11

Land

- Access, 12
- Acquisition, 12
- Condemnation, 12
- Costs, 32
- Easement, 12, 32
- Lease, 12, 32
- Ownership, 1
- Purchase, 12, 19

Lease, 12, 32

Legal Authority, 7, 11, 12

Legislation, 1, 2, 3, 7

- Needs, 9
- Requirements, 7
- Sub-committee reports, 2, 3
- Water pollution control, 1, 2

Location, 3, 12, 25, 26

Manual

- Guidelines, 1-3, 6
- Preliminary information, 3, 6, 25, 26

Maps, 13

Meteorology, 14

Methods

- Abatement, 7, 11, 15, 17, 25, 48
- Control, 15, 17, 25, 48
- Treatment, 16, 25, 48

Mine

- Background information, 13, 25
- Drainage, 1, 14, 25, 47
 - sources, 1, 3, 25, 26, 47
- Flooding, 14, 17
- Geology, 14
- Ownership, 1, 12
- Minerals, 13, 47
- Sealing, 17, 48
- Selection, 5, 7, 25, 26
- Subsidence, 13
- Surface, 47
- Types, 13

Mineral rights, 12, 33

Mining
 Future prevention of, 3, 7, 12, 13, 14
 Minerals, 1, 47

Neutralization, 48

Objectives, 3, 16

Operation, 5, 7, 13, 15, 21

Participation, 2

Patents and inventions, 29

Planning, 3, 25, 26

Pollution
 Abatement, 7, 11, 15, 17, 48
 Future, 3, 7, 12, 13, 14
 Inventory, 5, 7, 13, 14, 25, 26
 Mine drainage, 1, 14, 25, 47

Population, 15

Process
 Description of, 16
 Flowsheet, 16
 Specifications, 17, 18

Project, see specifications demonstration project, 17

Property
 Access, 12
 Acquisition, 12
 Condemnation, 12
 Cost, 32
 Easement, 12, 32
 Lease, 12, 32
 Ownership, 1, 32
 Purchase, 12, 19, 32

Rainfall, 15

Reclamation, 17, 48

- Reports
 - Feasibility study, 11-21
 - Format, 7, 23
 - Final, 3, 21
 - Progress, 21
- Revegetation, 17
- Schedules, 18, 21, 35
- Sealing, 17, 48
- Site
 - Project, 12
 - Selection, 3, 7, 25, 26
- Specifications, 17, 18
- Stream
 - Diversion, 17, 18, 48
 - Flow, 14
 - Records, 14
 - Standards, 12, 25
 - Quality, 12
- Surveillance, 3, 12, 20
- Surveys, 9, 13, 25
- Technology, 26, 47
- Topography, 9, 16
- Treatment, 12, 16
- Water
 - Analyses, 9
 - Demands, 13-15
 - Pollution, see "Pollution"
 - Quality, 14
 - Criteria, 12
 - Standards, 12, 25
 - Quantity, 14
 - Requirements, 12
 - Resources, 13-15
 - Rights, 12
 - Uses, 3, 15
- Water Pollution Control Act, 1

Water Quality Improvement Act - 1970, 2

Watershed, 2, 11, 14, 25